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AUTHOR Frantz, Nevin R., Jr.
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ABSTRACT

A project was conducted to develop and field test a computer based system to manage an individualized instructional approach for multioccupational programs in vocational education. A computer managed system was prepared which scheduled students individually for a variety of instructional areas within an occupational cluster. An individualized instructional module was delivered, via a computer terminal, which twenty ninth grade students completed under the direction of an instructor. Achievement of the cognitive information for this module was accomplished by a post-check which students received from the terminal. Feedback to the responses for the post-check items was provided to the students and a record of their status was kept by the computer and provided to instructors when needed. The results of the field test indicated that a viable computer managed instructional system for individualizing instruction in a multioccupational program could be developed and implemented successfully. Additional research and development should be conducted to determine the effectiveness and efficiency of the approach in providing career exploration experiences and job entry competencies for students enrolled in vocational education programs at the secondary school level. Appendixes comprise half of the thirty-two-page report and contain samples of the computerized materials used in the project. (Author/BL)

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Final Report

Project No. 498AH60022
Grant No. G007603807

THE DEVELOPMENT AND FIELD TESTING OF A COMPUTER-MANAGED DELIVERY SYSTEM FOR INDIVIDUALIZING INSTRUCTION IN MULTIOCCUPATIONAL PROGRAMS FOR VOCATIONAL EDUCATION

Nevin R. Frantz, Jr.
Principal Investigator

and

Edward E. Boas, Jr.
Project Coordinator

Occupational Education Department
College of Education
University of Delaware

Newark, Delaware 19711

July 20, 1977

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ABSTRACT

The project was conducted to develop and field test a computer-based system to manage an individualized instructional approach for multioccupational programs in vocational education. A computer-managed system was prepared which scheduled students individually for a variety of instructional areas within an occupational cluster. An individualized instructional module was delivered, via a computer terminal, which students completed under the direction of an instructor. Achievement of the cognitive information for this module was accomplished by a post-check which students received from the terminal. Feedback to the responses for the post-check items was provided to the students and a record of their status was kept by the computer and provided to instructors when needed. The results of the field test indicated that a viable computer-managed instructional system for individualizing instruction in a multioccupational program could be developed and implemented successfully. Additional research and development should be conducted to determine the effectiveness and efficiency of the approach in providing career exploration experiences and job entry competencies for students enrolled in vocational education programs at the secondary school level.

PREFACE

The principal investigator and project coordinator would like to acknowledge the assistance of several individuals in the conduct of this project. The support and cooperation of the administration and instructional staff of Delcastle Technical High School was instrumental in the success of the project. Acknowledgement is made to Mr. Conrad Shuman, superintendent, New Castle County Vocational-Technical School District; Mr. Carson Herr, principal; Mr. Donald Van Sciver, curriculum coordinator; Mr. Joe Deardorff, guidance counselor; Mr. Richard Clynes, data processing instructor; Mr. Sebastian Finocchiro, small engines repair instructor; Mr. Albert Leonard, aviation mechanics instructor; Mr. James King, auto mechanics instructor; Mr. Steven Marcinizyn, auto body repair; Mr. Jerry Ahrams, horticulture instructor; and Mr. Samuel Pantano, machine shop instructor. It was a pleasure to work with these individuals and the participating students during the project, and we appreciated their support and cooperation.

Nevin R. Frantz, Jr.
Principal Investigator

Edward E. Boas, Jr.
Project Coordinator

Newark, Delaware
June 29, 1977

The Development and Field Testing of a Computer-Managed Delivery System for Individualizing Instruction in Multioccupational Programs for Vocational Education

I. Introduction

The Vocational Education Act of 1963 and subsequent amendments in 1968 made provisions for serving larger numbers of students with a wider variety of occupational needs and interests. Federal legislation clearly states that vocational education should serve persons of all ages in providing training for gainful employment which is suited to their needs, interests, and ability. However, a disparity presently exists between legislative intents and viable programs that accommodate large numbers of students with a wide variety of career aspirations. One of the major challenges confronting vocational educators today is the problem of providing instructional programs for increasing numbers of students with a wide range of individual differences and at the same time making instruction realistic in terms of present and future employment opportunities.

Need. The diversity of students enrolled in high school vocational education programs requires a flexible and personalized approach to the delivery of instruction if the goal of providing student options is to be realized. For some students, who have made definite career decisions, the typical single skill program conducted in a three-hour time period over a three-year span may be an appropriate instructional environment. However, many students in high schools throughout this nation have not made definite career decisions and, in many instances, are still searching for their roles in life. Some students in this group have very little interest in school and its course offerings. These young people enroll in vocational education courses primarily to escape classroom environments which are unrewarding to them.

Other students enroll for avocational interests as evidenced by large enrollment in auto mechanics and cosmetology. There is still another group of students who have made tentative career decisions although they are not enrolled in vocational education courses to obtain in-depth skills or knowledge for a specific occupation. Examples of these kinds of young people range from college-bound students enrolled with aspiring secretaries in Typing I classes to students in health occupations classes who have plans for entering careers in the allied health fields as well as those who are striving to become licensed practical nurses. Other students have made firm decisions but find the specific job preparation approach does not completely satisfy their career plans. Consider the young man who plans to assume his father's radio-television sales and service business in a small town. This young person will need challenging experiences in an electronics course but will also need to obtain competencies in sales, marketing, and bookkeeping.

Another group of students, found in vocational education in increasing numbers, are the disadvantaged and handicapped. Quite often these students have been placed in vocational education programs

as a last resort in an effort to provide them with a minimum level of basic marketable skills. These exceptional young people, with physical, social, and emotional characteristics that differ from normal students, require unique learning experiences designed by instructors on an individual basis.

Although career exploration programs and effective career guidance will help to alleviate vocational decision-making problems, the fact remains that vocational education courses are presently, and will continue to be, composed of students with various career interests, a wide range of physical and mental abilities, and different sets of prior knowledge and experiences. For many of these students, the prospect and promise of satisfying and rewarding vocational education programs soon wanes, and they find themselves "locked in" to a full semester or year of competing with each other in accomplishing the same instructional objectives. The original, singular purpose of providing a skilled work force for local community consumption, although worthy for some students, is not compatible with many of the student characteristics that are brought to a learning situation. Therefore, a dilemma exists for teachers, supervisors, and administrative staffs in developing programs and instructional delivery systems that provide for student options and interests, as well as skills, knowledge, and attitudes needed for realistic employment opportunities. Perhaps a multioccupational approach to vocational education would provide a realistic alternative for vocational educators to consider in planning contemporary programs.

Multioccupational Approach. A multioccupational approach to vocational education is aimed at providing high school students with exploratory experiences and job entry competencies for several occupations. Its basic purposes are: (1) to provide young people in the process of crystallizing their career choice with exploratory experiences in several occupational areas, and (2) to develop basic competencies needed for job entry into one or more occupations. It is based upon the vocational development tasks of students and the need to prepare young people for entry into the world of work. The approach attempts to provide better reciprocity between the needs of youth and the manpower requirements of society.

A number of programs have been reported in the literature which were aimed at providing exploratory experiences and job entry competencies for one or more occupations. A project conducted by Maley (1967) was concerned with the development and implementation of a cluster concept approach to vocational education. Wolansky (1970) described a statewide effort to utilize a cluster approach to job preparation. Lorenz (1976) and others compared student achievement between multioccupational and single occupational students and found significant differences in favor of the former.

Individualized Instruction. In order to provide for a wide range of students with different abilities, attitudes, and interests an individualized instructional system is a necessity in the operation of a multioccupational approach to vocational education. An individualized instructional system for a multioccupational approach would identify individual student characteristics at the outset of instruction. This information would be used to select instructional objectives, resources,

and activities for each student. The achievement of objectives would be accomplished by students in a self-paced manner with periodic feedback of their performance. A final appraisal would be made by an instructor to ascertain the level of proficiency acquired by the student.

Several reports on individualizing instruction for multioccupational programs have appeared in the literature in recent years. A project reported by Harrison and Hephner (1972) discussed the use of learning activity packages for a distributive education program. Their approach emphasized the use of packages in preparing an individualized sequence of instruction which developed a different set of job entry competencies for each student. A project to prepare an individualized instructional system for ten different instructional areas was conducted at the University of Georgia. The project developed a series of instructional modules which were designed to provide the skills and knowledge required for a group of occupations related to a program area (Frantz, 1972).

Computer-Based Instruction. Another development paralleling the utilization of individualized instruction in educational programs is a computer-managed approach to instruction. The use of a computer with classroom terminals has been advocated as a means of carrying out and managing the individualized instructional process. The function of the computer is to collect and process information about each student and supply this information to a teacher in order to make individual instructional decisions (Cooley and Glaser, 1969).

During the past five years, a number of articles reported the use of a computer-managed system for instructional purposes in vocational and technical education. An article by Rannells (1973) described the use of a computer in evaluating student achievement in a horticultural program. A computer was used to randomly select a series of multiple choice questions and administer them to students. Scoring of the items was done by the computer with the results provided to the student and instructor. A modular approach to vocational education was described by Dupis and Bell (1974) which used a computer-based system to keep records of student achievement. The system provided a method of recording achievement of job tasks which could be provided to instructors when needed. A computer-managed system was developed by Danford and her associates (1974) which prescribed modules, scheduled students, and recorded their achievement of job tasks in a vocational education program.

Description of the Problem. The utilization of an individualized instructional system for a multioccupational approach to vocational education will require a well organized and efficiently managed operation. The identification of vocational interests and possible career goals with students will require the expertise and cooperation of guidance counselors assisting classroom teachers. Instructors will need to help students select specific instructional objectives which will provide exploratory experiences and/or job entry competencies compatible with career interests and goals. Determining student entry behavior for each objective in terms of prior experience, knowledge, and skill levels will require diagnosis and prescription of appropriate

instructional resources and learning activities on an individual basis. Scheduling students on a variable time, modular approach with multiple instructors will require administrators to develop an adjustable and flexible program pattern. Evaluation of individual student progress and achievement will be a necessity, and accurate, detailed records must be kept for instructional purposes as well as for future use by potential employers in determining the quantity and quality of student performance.

The management of an individualized instructional system in a multioccupational approach is a difficult and complicated procedure. However, it is mandatory if the concept of adapting vocational instruction to individual differences is to be fully realized for a wide variety and large number of young people at the secondary school level. A review of the literature reported previously indicated efforts are being expended in individualizing instruction for a variety of vocational education programs throughout the nation. Many of these programs were individualizing instruction through a paper-packaged delivery system. Others reported the use of a computer to schedule and manage students as they worked with printed instructional modules within a single classroom. None of the projects reported in the literature utilized a computer-based system to deliver and manage instruction for students in a variety of educational settings within a physical facility. The purpose of this project was to investigate the feasibility of delivering instructional modules and managing an individualized system for a multioccupational approach to vocational education using a computer-based technology.

II. Procedures of the Project

The project was conducted in two phases which involved the development of the computer-managed instructional system and the subsequent field testing of the completed system in a comprehensive vocational-technical education high school. The development of the computer-managed system was accomplished through services provided by membership in Project DELTA, which is supported by the Delaware School Auxiliary Association. The primary purpose of Project DELTA is to engage in research activity dedicated to establishing a computer network for use by public secondary school systems. The project utilizes a Digital Equipment Corporation (DEC) PDP 11/50 computer system located at the University of Delaware with 35 remote Decwriter II terminals located in various schools throughout the state.

Members of the Project DELTA staff, working in cooperation with the principal investigator and project coordinator, developed a computer program, using the Basic-Plus Language, which would deliver a series of instructional modules, schedule students for various classrooms, and record their completion of the instructional objectives. During the same time period, two Decwriter II terminals were delivered and installed. One terminal was placed at the university for input purposes, while the other was located at the field testing site. (See Appendix A)

During the software development process and the installation of the hardware, the project staff began working with the administrative and instructional staff of Delcastle Technical High School in developing the individualized instructional system for a multioccupational approach to vocational education. This high school, which is a full-time comprehensive facility, serves eleven school districts in New Castle County, which is located in the northern section of Delaware. It enrolls approximately 1600 students with an instructional staff of 110 teachers. Students are enrolled in 35 different programs in grades 9 through 12 and receive both academic and vocational preparation in the school.

The initial activity at Delcastle Technical High School was to identify a group of interested teachers who were willing to participate in the project. After consultation with several of the faculty and administrators soon after school began in September, a group of teachers was identified representing the instructional areas of data processing, small engines, aviation mechanics, auto body repair, machine shop, horticulture, and auto mechanics. The teachers and project staff began to determine a number of goals and objectives for a six-week exploratory program for ninth grade students which was functioning in the school at that time. Each instructor was asked to develop six instructional objectives for his area which would provide job samples for the student and develop some basic job entry competencies. After these objectives were identified, the project coordinator, with the assistance of the instructors, developed an individualized instructional module for each one. The instructional modules consisted of: (1) a terminal performance objective, (2) a pre-check, (3) a number of enabling objectives, (4) instructional resources, (5) learning activities, (6) feedback, and (7) a post-check. (See Appendix E) The completed modules were assembled and stored in the PDP 11/50 computer.

As the modules were being compiled, the project staff began working with one of the guidance counselors at Delcastle to identify 20 ninth-grade students who could be scheduled for field testing the system in February. The primary criteria used in selecting the students was to include those that had not had any previous instruction in any of the areas selected for the project.

It soon became apparent that this approach was not possible since many of the students had had some prior experiences in one or more of the instructional areas during the first part of the school year. After carefully analyzing the students' schedules and a personal interview, a group of twenty students was selected to participate in the field testing phase. Of the twenty students, nine had been in one or more of the areas for six weeks while the remaining students had not been scheduled for any of the areas.

During the first phase of the project, a series of meetings was held with the principal, the curriculum director of the school, one of the guidance counselors, and the instructional staff participating in the project. The purpose of these meetings was to inform the group of recent developments and progress, as well as to recieve input concerning the design and content of the instructional modules. The Instructors also provided information about instructional media and materials which were then purchased by the project staff. Discussions

were also held to clarify the procedures for each teacher in using the instructional modules as delivered by the computer.

As these developmental activities were completed, the project staff and instructors began the field testing phase of the project. A decision was made to initiate the field testing during the fourth grading period of the school year. The students participating in the project received an orientation using the computer terminal. In addition to the orientation, the students were given a tour of the six instructional areas where each teacher presented a short description of the activities performed in a particular shop or laboratory. After receiving the tour, each student with the assistance of the project staff began the process of selecting the first instructional module. This selection process was accomplished by having the student sign on at the computer terminal and execute the program where he or she was given a list of occupational clusters and special programs within the cluster (See Appendix B). After selecting the desired program, a list of descriptor words was provided for the instructional modules available in that program area. The student selected one or more of these descriptors and received a printout of the specific terminal performance objective for that instructional module (See Appendix C). When each student had selected their respective modules, this information was processed and a printout was obtained which scheduled them for a teacher, classroom, and time period. The next procedure was to begin the first instructional module. If a student felt that they had already acquired some knowledge or skill needed to perform the terminal performance objective of the instructional module, they would receive a pre-check from the computer which appraised their entry behavior (See Appendix D). Responses to the pre-check were entered into the computer which analyzed the information and indicated which instructional package(s) the student should use. If the student did not take the pre-check, all the instructional packages for the module were then provided on the terminal (See Appendix E).

After receiving the instructional package printouts, the student moved to his or her respective laboratory or shop. In using the instructional package, the student initially read the enabling objective and selected learning resources from those listed which were considered appropriate for their learning style. After utilizing the resource, the student applied the knowledge or practiced the skill as directed in the activity section. Upon completion of the learning activity, each student verified their performance in the feedback section. If the criterion performance as stated in the enabling objective was accomplished successfully, the student advanced to the next instructional package. Students who were unsuccessful turned to a recheck or remedial section and completed the activities as directed until mastering the enabling objective.

After successfully completing the enabling objectives for all instructional packages, the student was ready to be evaluated on achievement of the terminal performance objective. The student returned to the computer terminal and obtained a post-check which would contain multiple choice items and/or went to the instructor for an evaluation of a manipulative skills performance. After completing a multiple choice post-check, the student recorded the responses at the terminal and received feedback concerning their status. If the results were satisfactory, the next

instructional module was obtained by the student. Students who were not successful were directed by the instructor to engage in a remedial route such as completing a specific activity before attempting the post-check again. The status of each student was automatically recorded and delivered upon request to teachers, counselors, and administrators (See Appendix F).

All of the twenty students were required to completed at least one instructional module in each of the six program areas or shops participating in the project. After completing the six modules, the students could then elect to concentrate in one area or move to other shops depending on their interests and opening in the schedule.

III. Results of the Project

The implementation and field testing of the computer-managed system was conducted over a six-week period of time. During this time twenty students successfully completed eighty instructional modules (See Appendix H). As the field testing progressed, periodic on-site visitations were made by the principal investigator to monitor the system in operation and make any necessary adjustments to problems as they occurred. In addition to the on-site visitations, an evaluation of the approach was made by requesting the participating students to complete a four question, short answer, written response questionnaire (See Appendix I). After the questionnaire was completed, an informal discussion was held by the principal investigator with the students. Another informal discussion session was held with the curriculum director, the guidance counselor, the participating teachers, the project coordinator, and the principal investigator.

An analysis of these observations, written responses, and informal discussions indicated several positive outcomes had occurred as a result of field testing the computer-managed system for a multioccupational approach. The information collected from the students indicated that most of them felt the experience was beneficial in several ways. The most consistent response to the question, what students liked about the exploratory program, was the opportunity to visit several shops and be involved in one or more of the activities in each area. A total of nineteen out of twenty students expressed this viewpoint. During the informal discussion sessions, several students stated that as a result of the brief experience in each shop they had a better idea of what the school programs were and felt better about making a decision to enroll in a particular program during the tenth grade. Other students expressed the opinion that they enjoyed the option of spending a minimum amount of time as opposed to six weeks in a shop which was not of interest to them and could elect to spend more time in other areas which they would not ordinarily have a chance to explore.

Another benefit that the students recognized was the opportunity to use a computer in the instructional process. The majority of students expressed a positive reaction to receiving the instructional modules and taking the post-checks via the computer terminal. Several of the

students also mentioned favorably the self-pacing aspects of the computer-managed system and the immediate feedback they received to their responses on the post-check.

Discussions with the participating instructors indicated that they also felt the option for students to spend variable time periods in their shops as opposed to a standard six-week period was a beneficial aspect of the program. Their recommendation was to continue with a required instructional module for each student in a shop or laboratory but to allow the students to select the shops and modules after the initial exposure. The instructors were also very positive about the records that the computer kept of each student's achievement. One concern of the instructors was a need for adding the capability of the computer to keep records of successful manipulative skill performance of each student.

During several of the on-site visitations by the project staff, a persistent problem was observed that was later confirmed by the students in their written responses. The availability of a single computer terminal for twenty individuals caused problems in students accessing the instructional modules. This problem caused students to spend an unreasonable amount of time waiting to use the computer terminal in obtaining the instructional modules and post-checks. One obvious solution to the problem would be to provide additional terminals and located them in easily accessible areas convenient to most of the shops and classrooms.

Another related problem occurred with student scheduling of the instructional modules. Several times students completed the instructional modules and post-checks before their allotted time in a particular area was over. Since the computer was programmed only to accept a student after an estimated time period for each module, the student was unable to schedule another instructional module in a different program or shop area. This created problems for the instructors and students in finding alternate activities that would be satisfactory until the student could be rescheduled for another area. Several suggestions were made by the instructors to modify the program so that students could be scheduled when needed for an instructional module in another program area. Other suggestions included increasing the time and providing for alternate elective activities in the instructional modules.

Additional problems occurred with students completing the post-checks for each instructional module. Since there was only one post-check developed for each module, it was easily compromised and allowed some students to demonstrate proficiency successfully when in fact they were not really capable of achieving the terminal performance objective. Other students taking the post-check took the same test several times and reached criterion by a process of elimination. The problem could be alleviated by developing alternate forms of the post-check or having a bank of items which could be randomly generated for each individual student.

During the last phase of the project, several modifications were made to the existing program to allow for greater flexibility in student scheduling. Modifications were also made to the program in

for students and teachers to easily access a portion of the total instructional system such as the pre- and post-checks, terminal performance objectives, and enabling objectives. A considerable amount of time was spent in developing a procedure for students to receive feedback on responses to three alternate post-checks for each instructional module in the system.

IV. Conclusions and Recommendations

The results of the project indicate that a viable computer-managed delivery system for individualizing instruction in a multi-occupational program for vocational education could be developed and implemented successfully. Although field testing of the computer-based system was limited to a small number of students involved primarily in occupational areas related to transportation, mechanics, and repair, it does serve as a model for other vocational curriculum developers and administrators to emulate in providing career exploration experiences and job entry competencies for students at the secondary school level. The project demonstrated that it was feasible to develop a computer-managed instructional system that could individualize instruction for students and provide scheduling and record-keeping services to instructors for students enrolled in a variety of different occupational program areas.

Although initial efforts in developing and field testing the system were successful, additional activities are needed to evaluate the effectivness and efficiency of a computer-based instructional system for a multioccupational approach to vocational education. The modified system should be evaluated in terms of its cost as related to benefits and effectivness. Research could be conducted which examines the effectiveness of the system in meeting the career development needs of vocational education students. Additional research concerns could involve the efficiency of the approach in developing job entry competencies for one or more occupations. Comparison could be readily made with existing programs to determine if a computer-based system is an effective and efficient method of providing career exploratory experiences and job entry competencies on an individualized instructional basis for students enrolled in vocational education programs.

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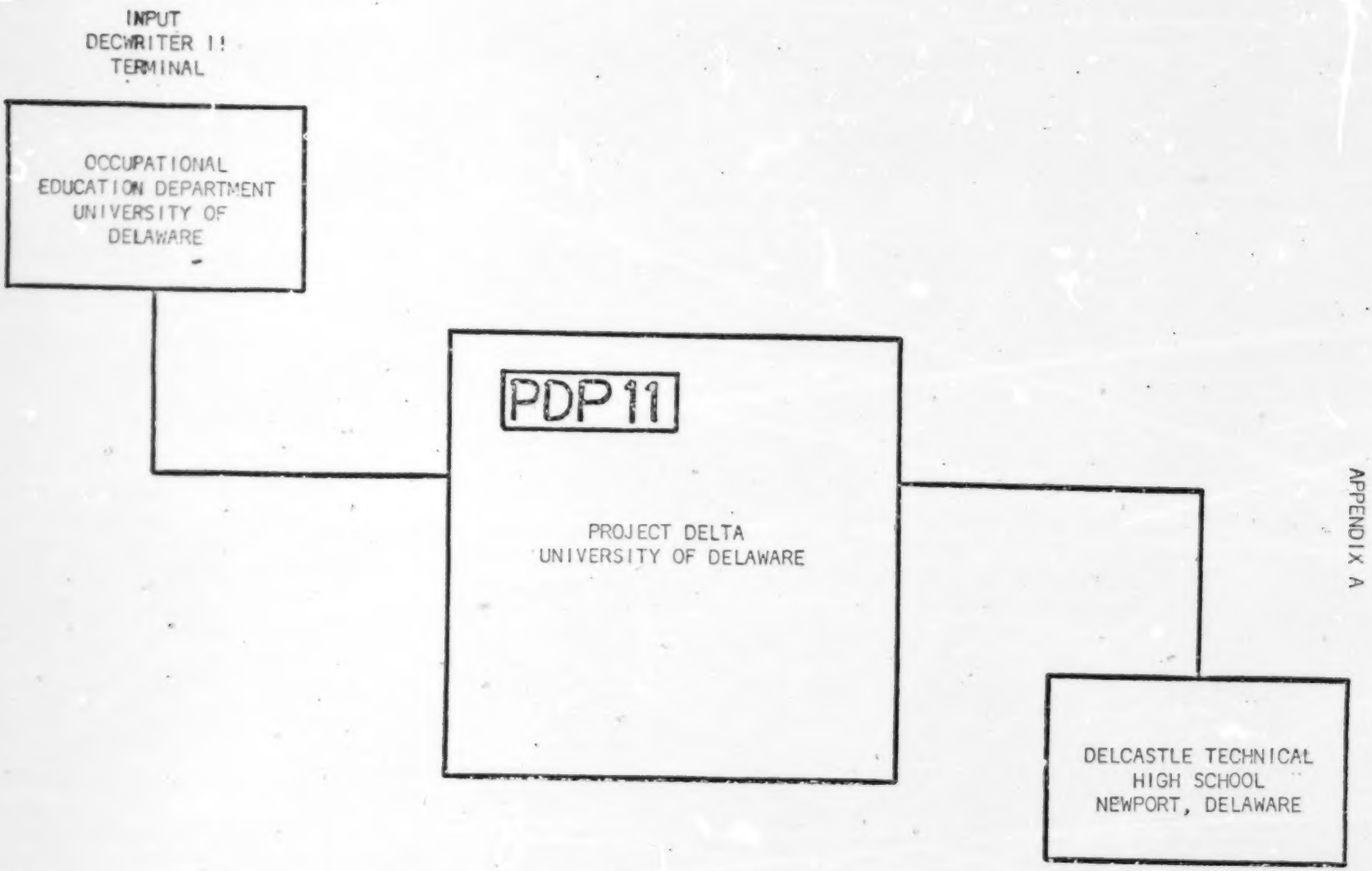
INPUT
DECWRITER II
TERMINAL
OCCUPATIONAL
EDUCATION DEPARTMENT
UNIVERSITY OF
DELAWARE
PDP 11
PROJECT DELTA
UNIVERSITY OF DELAWARE
DELCASTLE TECHNICAL
HIGH SCHOOL
NEWPORT, DELAWARE
OUTPUT
DECWRITER II
TERMINAL

APPENDIX A

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RUNEXPLORE

EXPLORE V2.77 -- EXPLORE AREAS IN OCCUPATIONAL EDUCATION
                 UNIVERSITY OF DELAWARE - DEPARTMENT OF OCCUPATIONAL EDUCATIO

WOULD YOU LIKE TO BE SCHEDULED TO WORK ON SOME MODULES (YES OR NO)? NO
WHAT IS YOUR FULL NAME? EDWARD BOAS
HERE IS WHAT YOU MAY DO:

        1.)  OBTAIN A LIST AND DESCRIPTION OF SOME OF THE AREAS
             WHICH YOU MAY WORK ON.
        2.)  TAKE A PRE-CHECK ON AN AREA OF YOUR CHOICE.
        3.)  TAKE A POST-CHECK ON AN AREA OF YOUR CHOICE.
        4.)  START WORKING ON A MODULE YOU HAVE SELECTED.

IF THIS IS THE FIRST TIME YOU HAVE USED THIS PROGRAM
YOU SHOULD USE THE FIRST OPTION.

PLEASE TYPE THE NUMBER OF THE ABOVE OPTION YOU WISH TO USE? 1

THE FOLLOWING CLUSTERS ARE AVAILABLE:

AG -- AGRICULTURE
M  -- MANUFACTURING
T  -- TRANSPORTATION

WHICH CLUSTER DO YOU WANT TO USE? AG


THE FOLLOWING AREAS IN AGRICULTURE ARE AVAILABLE:

OH -- ORNAMENTAL HORTICULTURE
HM -- HORTICULTURE MECHANICS
AC -- ACTIONS - R. BARLOW

WHEN ASKED WHICH AREA YOU WANT TO USE YOU SHOULD TYPE IN THE
ABREVIATION WHICH APPEARS BEFORE THE TWO DASHES.

IF YOU WISH TO GO BACK TO A NEW CLUSTER PRESS THE RETURN
KEY IN RESPONSE TO THE FOLLOWING QUESTION.

WHICH AREA DO YOU WISH TO USE? OH

HERE IS A LIST OF THE KEY WORDS FOR EACH TERMINAL
PERFORMANCE OBJECTIVE.

1.)   JOB OPPORTUNITIES
2.)   ORNAMENTAL PRUNING
3.)   PLANTING ORNAMENTAL TREES AND SHRUBS

YOU WILL NOW BE ABLE TO GET A MORE DETAILED DESCRIPTION
OF ANY OF THESE TERMINAL PERFORMANCE OBJECTIVES.
```

ENTER THE NUMBERS OF THE TPO'S YOU WOULD LIKE DESCRIBED? 1,2,3

1. DEMOSTRATE YOUR KNOWLEDGE OF JOB OPPORTUNITIES IN HORTICULTURE BY ANSWERING 13 OF 15 MULTIPLE CHOICE QUESTIONS.

2. GIVEN AN OVERGROWN PLANT SPECIMEN, THE STUDENT WILL CORRECTLY PRUNE THE PLANT ACCORDING TO THE CRITERIA PROVIDED BY THE INSTRUCTOR, AND GIVE REASONS FOR MAKING EACH CUT.

3. GIVEN A PLANT SPECIMEN SELECTED BY THE INSTRUCTOR, THE STUDENT WILL CORRECTLY PLANT THE SPECIMEN ACCORDING TO THE CRITERIA SET BY THE INSTRUCTOR.

DO YOU WISH TO OBTAIN A DESCRIPTION OF ANY MORE? (YES OR NO)? NO

AT THIS TIME YOU MAY GO BACK AND LOOK AT ANOTHER AREA
OR YOU MAY CHOOSE A TPO THAT YOU WISH TO WORK ON.

DO YOU WISH TO GO BACK AND LOOK AT ANOTHER AREA OR CLUSTER? (YES OR NO)? YES

IF YOU WISH TO GO BACK TO A NEW CLUSTER PRESS THE RETURN
KEY IN RESPONSE TO THE FOLLOWING QUESTION.

WHICH AREA DO YOU WISH TO USE? HM

HERE IS A LIST OF THE KEY WORDS FOR EACH TERMINAL
PERFORMANCE OBJECTIVE.

1.) SMALL ENGINE TYPES
2.) BASIC HAND TOOLS **COMING SOON**
3.) 4 STROKE CYCLE ENGINE OPERATION **COMING SOON**
4.) CLEANING
5.) LUBRICATING
6.) CARBURETOR AIR CLEANERS
7.) BATTERIES
8.) REFUELING SMALL ENGINES **COMING SOON**
9.) BREAKER POINTS **COMING SOON**

YOU WILL NOW BE ABLE TO GET A MORE DETAILED DESCRIPTION
OF ANY OF THESE TERMINAL PERFORMANCE OBJECTIVES.

ENTER THE NUMBERS OF THE TPO'S YOU WOULD LIKE DESCRIBED? 1,2,3,4,5,6,7,8,9

1. SELECT AND DIFFERENTIATE TYPES OF SMALL ENGINES AND HOW THEY WORK BY CORRECTLY RESPONDING TO 13 OUT OF 16 QUESTIONS AND BE PREPARED TO DEMONSTRATE YOUR COMPETENCE TO YOUR INSTRUCTOR.

2. IDENTIFY 25 SPECIFIED HANDTOOLS AND ANSWER 14 OUT OF 16 QUESTIONS CORRECTLY ABOUT THEIR USE IN HORTICULTURE MECHANICS.

3. GIVEN A 4 STROKE CYCLE ENGINE DESCRIBE THE 4 STROKE CYCLE AND ANSWER 15 OUT OF 16 QUESTIONS CORRECTLY.

4. DEMONSTRATE YOUR KNOWLEDGE OF CLEANING A SMALL ENGINE BY ANSUERING CORRECTLY 13 OUT OF 15 QUESTIONS AND CLEAN A SMALL ENGINE USING CORRECT MATERIALS ACCORDING TO MANUFACTURER'S SPECIFICATIONS.

5. INDICATE THE DIFFERENT TYPES OF LUBRICATING SYSTEMS AND THEIR PROPER CARE BY COMPLETING 15 OUT OF 17 QUESTIONS AND LUBRICATE A SMALL ENGINE USING MANUFACTURER'S SPECIFICATIONS.

6. DISTINGUISH BETWEEN TYPES OF AIR CLEANERS AND EXAMINE THEIR IMPORTANCE AND USE, BY ANSWERING 17 OUT OF 19 QUESTIONS CORRECTLY, AND SERVICE VARIOUS AIR CLEANERS USING MANUFACTURER'S SPECIFICATIONS FOR THE INSTURCTORS INSPECTION.

7. EXHIBIT YOUR UNDERSTANDING OF BATTERIES BY RESPONDING TO 22 OUT OF 25 QUESTIONS CORRECTLY, AND CHECK AND SERVICE A BATTERY ACCORDING TO MANUFACTURER'S SPECIFICATIONS.

8. REFUEL SMALL ENGINES ACCORDING TO MANUFACTURER'S SPECIFICATIONS, AND ANSWER 11 OUT OF 13 QUESTIONS CORRECTLY.

9. THE STUDENT MECHANIC WILL BE ABLE TO SERVICE A SET OF BREAKER POINTS WITHOUT ERROR ACCORDING TO MANUFACTURERS SPECIFICATIONS AND ANSWER 7 OUT OF 8 QUESTIONS CORRECTLY.

DO YOU WISH TO OBTAIN A DESCRIPTION OF ANY MORE? (YES OR NO)? NO

AT THIS TIME YOU MAY GO BACK AND LOOK AT ANOTHER AREA
OR YOU MAY CHOOSE A TPO THAT YOU WISH TO WORK ON.

IF YOU WISH TO GO BACK TO A NEW CLUSTER PRESS THE RETURN
KEY IN RESPONSE TO THE FOLLOWING QUESTION.

WHICH AREA DO YOU WISH TO USE?

WHICH CLUSTER DO YOU WANT TO USE? M

DO YOU WISH TO OBTAIN A DESCRIPTION OF ANY MORE? (YES OR NO)? NO

AT THIS TIME YOU MAY GO BACK AND LOOK AT ANOTHER AREA
OR YOU MAY CHOOSE A TPO THAT YOU WISH TO WORK ON.

DO YOU WISH TO GO BACK AND LOOK AT ANOTHER AREA? (YES OR NO)? NO
WHICH TPO DO YOU WISH TO WORK ON? 2

THE NAME OF THE MODULE YOU HAVE CHOSEN IS T-SE-02
PLEASE REMEMBER THIS AS YOU WILL NEED TO REFER TO IT LATER.

IF YOU WISH YOU MAY NOW TAKE A PRE-CHECK. IF YOU PASS
THE PRE-CHECK YOU WILL HAVE COMPLETED THIS MODULE.

DO YOU WISH TO TAKE THE PRE-CHECK? YES

INSTRUCTIONS: AFTER THIS PRE-CHECK HAS BEEN PRINTED OUT, ANSWER THE QUESTIONS BY UNDERLINING THE CORRECT ANSWER. BE PREPARED TO FEED INTO THE COMPUTER YOUR CORRECT RESPONSES.

1. MOST SMALL ENGINES ARE COOLED BY _____ FLOWING AROUND THE CYLINDER.

   A. AIR
   B. WATER
   C. HEAT
   D. OIL

2. ABOUT ONE THIRD OF ENGINE _____ IS GIVEN OFF THROUGH THE COOLING SYSTEM.

   A. ENERGY
   B. FUEL
   C. HEAT
   D. POWER

3. ANOTHER THIRD OF ENGINE HEAT IS LOST THROUGH THE _____ SYSTEM.

   A. FUEL
   B. COOLING
   C. EXHAUST
   D. POWER

4. COOLING _____ ON THE OUTSIDE OF THE CYLINDER AND CYLINDER HEAD HELP TRANSFER HEAT TO THE AIR.

   A. FINS
   B. VALVES
   C. SYSTEMS
   D. RIDGES

5. DIRT AND GREASE ON THE OUTSIDE OF AN ENGINE CAN CAUSE IT TO _____.

   A. RUN COOL
   B. STOP
   C. OVERHEAT

```
Ready

RUNEXPLORE

EXPLOR -- EXPLORE AREAS IN OCCUPATIONAL EDUCATION

WHAT IS YOUR FULL NAME? EDWARD BOAS
HERE IS WHAT YOU MAY DO:

        1.)  OBTAIN A LIST AND DESCRIPTION OF SOME OF THE AREAS
             WHICH YOU MAY WORK ON.
        2.)  TAKE A PRE-CHECK ON AN AREA OF YOUR CHOICE.
        3.)  TAKE A POST-CHECK ON AN AREA OF YOUR CHOICE.

IF THIS IS THE FIRST TIME YOU HAVE USED THIS PROGRAM -
YOU SHOULD USE THE FIRST OPTION.

PLEASE TYPE THE NUMBER OF THE ABOVE OPTION YOU WISH TO USE? 2

YOU WILL NOW BE ABLE TO ENTER YOUR ANSWERS FOR ANY PRE-CHECK
YOU WERE PREVIOUSLY GIVEN.


YOU MAY ENTER YOUR ANSWERS FOR ANY OF THE FOLLOWING PRE-CHECK'S.

        1.) AG-OH-01
        2.) T-SE-02

PLEASE ENTER THE NUMBER OF THE PRE-CHECK YOU WISH TO ENTER
YOUR ANSWERS FOR.  MAKE ABSOLUTELY SURE YOU PICK THE ONE WHICH
CORRESPONDS WITH YOUR QUIZ OR YOU WILL BE GRADED WRONG.

WHICH NUMBER? 2

PLEASE ENTER YOUR ANSWERS AFTER THE QUESTION MARK
SEPERATED WITH COMMAS.

? A,C,C,A,B,C,C,C,C,B,A,B,D,D,C

 9 OF YOUR ANSWERS WERE WRONG.

VERY GOOD!
YOU WILL NOT NEED TO WORK ON ENABLING OBJECTIVE 1
FOLLOWING IS A MODULE OF THE MATERIALS WHICH YOU SHOULD RETURN TO CLASS AND
WORK ON.
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ENABLING OBJECTIVE # 2

OBJECTIVE

A. ANSWER CORRECTLY FOUR QUESTIONS ABOUT THE CLEANING AND INSPECTION OF THE CRANKCASE AND ACCESSORIES.

B. CLEAN AND INSPECT THE CRANKCASE AND ACCESSORIES ACCORDING TO MANUFACTURER'S SPECIFICATIONS.

RESOURCES

BOOKS: SMALL ENGINES, VOLUME 1.
MANUFACTURER'S REPAIR MANUALS

TOOLS AND MATERILAS: PAGE 25 IN SMALL ENGINES, VOLUME 1, HAS A LIST OF TOOLS AND MATERIALS NEEDED TO CLEAN AND INSPECT THE CRANKCASE.

ACTIVITY A

READ THE SECTION TITLED, "CLEANING AND INSPECTING THE CRANKCASE AND ACCESSORIES," AND STUDY FIGURES 17-21 ON PAGES 25-28 IN THE BOOK, SMALL ENGINES, VOLUME 1. IF NECESSARY, REFER TO THE REPAIR MANUAL FOR THE PARTICULAR ENGINE YOU ARE WORKING ON FOR FURTHER INFORMATION ON CLEANING THE ENGINES.

ANSWER CORRECTLY THE FOLLOWING QUESTIONS:

1. BECAUSE IT IS FLAMMABLE AND A FIRE HAZARD, _____ SHOULD NOT BE USED TO CLEAN AN ENGINE.

2. WHEN CLEANING THE ENGINE, IT SHOULD BE:
A. HOT, B. COLD, C. WARM.

3. CHEMICAL DEGREASERS ARE FLUSHED OFF THE ENGINE WITH _____.

4. A _____ SOLVENT SUCH AS MINERAL SPIRITS, KEROSENE OR DIESEL FUEL MAY BE USED TO CLEAN THE ENGINE.

CHECK

WHEN YOU HAVE FINISHED ANSWERING THE QUESTIONS, CHECK YOUR ANSWERS WITH THOSE LISTED BELOW. IF YOU HAVE MISSED ANY, GO BACK AND REVIEW THE RESOURCES UNTIL YOU CAN ANSWER THE QUESTIONS CORRECTLY. IF YOU ARE STILL HAVING PROBLEMS, ASK YOUR INSTRUCTOR FOR HELP.

1. GASOLINE
2. C. WARM
3. WATER
4. PETROLEUM

ACTIVITY B

CLEAN THE ENGINE BY FOLLOWING THE PROCEDURES ON PAGES 25 THROUGH 28 IN SMALL ENGINES, VOLUME 1.

REFER TO THE MANUFACTURER'S REPAIR MANUAL FOR THE PARTICULAR ENGINE YOU ARE WORKING ON IF NECESSARY.

CHECK

WHEN YOU HAVE FINISHED AVTIVITY B, HAVE THE INSTRUCTOR CHECK YOUR WORK. IF NECESSARY, REVIEW THE RESOURCES AND ACTIVITIES OR ASK YOUR

19

```
Ready

RUNREPORT

REPORT V2.77 -- REPORTS STUDENT'S PROGRESS AND UPDATES STUDENT LIST
                UNIVERSITY OF DELAWARE - DEPARTMENT OF OCCUPATION EDUCATION

ENTER THE PASSWORD?

TYPE 'HELP' IF YOU NEED ASSISTANCE.

ENTER COMMAND? PRINT
PRINT -- PRINTS STUDENTS PROGRESS

IF YOU WISH NOT TO ANSWER ANY OF THE FOLLOWING QUESTIONS
JUST PRESS THE RETURN KEY.  FOR HELP TYPE 'HELP'.

PLEASE ENTER THE RANGE OF NUMBERS TO USE?
SORT BY (1) NAME OR (2) NUMBER? 2


PROGRESS REPORT FOR 17-MAR-76 AT 12:06 PM

STUDENTS LISTED: ALL

STATUS KEY:

0 = MODULE GIVEN WITHOUT PRE-CHECK
1 = PRE-CHECK GIVEN BUT NOT CHECKED YET
2 = FAILED ONE OR MORE EO'S OF PRE-CHECK
3 = PASSED PRE-CHECK
4 = POST-CHECK GIVEN BUT NOT CHECKED YET
5 = PASSED POST-CHECK (PASSED TPO)
6 = FAILED POST-CHECK (FAILED TPO)
7 = SCHEDULED FOR MODULE BY 'SELECT'


0001 EDWARD BOAS          T-SE-02 (5,11:52 AM,17-MAR-76,12:03 PM,17-MAR-76)



ENTER COMMAND? EXIT

Ready
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Cluster: Transportation

Area: Auto Body

1. Shop Safety
2. Painting Equipment
3. Painting Preparation

Area: Auto Mechanics

1. Shop Safety
2. Basic Hand Tools
3. Introduction/Auto Engine
4. 4 Stroke Cycle Engine Operation
5. Engine Cylinder Components
6. Batteries
7. Measurement/Micrometers
8. Engine Cooling System

Area: Aviation

1. Intro. To Aviation
2. Basic Hand Tools
3. Manual Use
4. Safety Wiring
5. Measurement/Micrometers
6. Measurement/Vernier Calipers
7. Power Drilling Tools
8. Drill Press

Area: Small Engines

1. Intro. To Small Engines
2. Basic Hand Tools

3. Types
4. Cleaning
5. Lubricating
6. Carburetor Air Cleaners
7. Batteries
8. Valve Servicing
9. Refueling Small Engines

Cluster: Agriculture

Area: Ornamental Horticulture

1. Intro. To Horticulture
2. Ornamental Pruning
3. Planting Ornamental Trees and Shrubs

Area: Horticulture Mechanics

1. Small Engine Types
2. Basic Hand Tools
3. 4 Stroke Cycle Engine Operation
4. Cleaning
5. Lubricating
6. Carburetor Air Cleaners
7. Batteries
8. Refueling Small Engines
9. Breaker Points

Cluster: Manufacturing

Area: Machine Trades

1. Intro. To Machine Trades
2. Measurement/Scale

3. Intro. Trigonometry
4. Shop Terms
5. Measurement/Micrometers
6. Measurement/Lower Drum Shaft
7. Grinding/Tool Bit

APPENDIX H

STUDENT NUMBER	AREA	MODULE	STATUS	START/FINISH (TIME, MONTH-DAY)
0031	SE	TYPES	5	11:50AM, 01-25-77; 02:20PM, 01-31-77
	AB	PAINTING PREPARATION	5	01:58PM, 02-01-77; 02:57PM, 01-04-77
	OH	PLANTING ORNAMENTAL TREES AND SHRUBS	5	01:43PM, 02-08-77; 02:09PM, 02-11-77
	MT	GRINDING DRILL BIT	6	02:13PM, 02-11-77; 01:42PM, 02-15-77
	AV	SAFETY WIRING	6	01:46PM, 02-15-77; 01:30PM, 02-22-77
0032	AM	INTRODUCTION/ AUTO ENGINE	5	02:37PM, 01-25-77; 12:47PM, 02-02-77
	MT	MEASUREMENT/ SCALE	4	12:52PM, 02-02-77; 01:52PM, 02-04-77
	AV	SAFETY WIRING	6	12:45PM, 02-09-77; 03:05, 02-15-77
	AB	PAINTING EQUIPMENT	6	11:18AM, 02-16-77; 01:20PM, 02-22-77
	MT	GRINDING DRILL BIT	5	01:03PM, 02-24-77; 02:09PM, 02025-77
	AM	SHOP SAFETY	5	01:34PM, 02-22-77; 02:51PM, 02-23-77
	SE	CLEANING	5	12:57PM, 02-23-77; 01:07PM, 02-25-77
	HM	LUBRICATING	6	12:46PM, 02-28-77; 01:52PM, 03-01-77
	HM	LUBRICATING	5	02:23PM, 03-01-77; 02:11PM, 03-02-77
	MT	MEASUREMENT/ SCALE	0	12:54PM, 03-03-77; 11:42PM, 03-04-77
0033	SE	LUBRICATING	5	12:58PM, 01-25-77; 02:24PM, 01-31-77
	AB	PAINTING PREPARATION	6	01:24PM, 02-01-77; 02:00PM, 02-08-77
	OH	PLANTING ORNAMENTAL TREES AND SHRUBS	5	02:04PM, 02-08-77; 02:27PM, 02-11-77

	MT	GRINDING DRILL BIT	6	02:30PM, 02-11-77; 01:33PM, 02-15-77
	AV	SAFETY WIRING	6	01:38PM, 02-15-77; 01:39PM, 02-22-77
	AM	SHOP SAFETY	5	01:42PM, 02-22-77; 02:58PM, 02-23-77
	AB	PAINTING PREPARATION	6	01:12PM, 02-24-77; 01:56PM,, 02-28-77
	MT	GRINDING DRILL BIT	5	02:02PM, 02-28-77; 01:45PM, 03-01-77
	AV	SAFETY WIRING	5	12:49PM, 03-02-77; 02:53PM, 03-07-77
0034	AV	SAFETY WIRING	6	12:45PM, 01-25-77; 01:25PM, 02-03-77
	AM	4-STROKE CYCLE ENGINE OPERATION	5	01:30PM, 02-03-77; 02:04PM, 02-09-77
	AB	PAINTING EQUIPMENT	6	02:07PM, 02-09-77; 02:38PM, 02-14-77
	HM	CARBURETOR AIR CLEANERS	5	02:49PM, 02-14-77; 02:17PM, 02-15-77
	MT	SHOP TERMS	5	02:20PM, 02-15-77; 02:29PM, 02-16-77
	SE	CARBURETOR AIR CLEANERS	5	02:31PM, 02-16-77; 02:21PM, 02-18-77
	SE	LUBRICATING	5	02:31PM, 02-18-77; 02:31PM, 02-22-77
	AV	SAFETY WIRING	4	12:44PM, 02-22-77; 02:02PM, 02-23-77
	SE	CLEANING	5	02:05PM, 02-25-77; 02:52PM, 02-28-77
	HM	LUBRICATING	5	01:18PM, 03-02-77; 01:09PM, 03-07-77
	AB	PAINTING EQUIPMENT	0	01:16PM, 03-07-77
0035	AV	SAFETY WIRING	6	02:51PM, 01-25-77; 03:05PM, 02-02-77
	AB	PAIGTING PREPARATION	6	01:20PM, 02-04-77; 01:54PM, 02-09-77
	AM	4-STROKE CYCLE ENGINE OPERATION	5	02:53PM, 02-09-77; 01:11PM, 02-14-77
	SE	TYPES	5	01:15PM, 02-14-77; 01:59PM, 02-16-77
	MT	SHOP TERMS	5	02:01PM, 02-16-77; 02:37PM, 02-22-77

	HM	CARBURETOR AIR CLEANERS	5	03:01PM, 02-22-77; 01:44PM, 02-25-77
	AV	SAFETY WIRING	5	01:48PM, 02-25-77; 02:50PM, 03-02-77
	AB	PAINTING PREPARATION	4	09:36AM, 03-03-77
0036	AB	PAINTING PREPARATION	6	12:53PM, 01-25-77; 01:34PM, 02-02-77
	SE	TYPES	5	01:42PM, 02-02-77; 01:50PM, 02-11-77
	AM	SHOP SAFETY	5	01:55PM, 02-11-77; 02:00PM, 02-15-77
	AV	SAFETY WIRING	6	02:04PM, 02-15-77; 01:23PM, 02-22-77
	MT	SHOP TERMS	5	01:27PM, 02-23-77; 01:19PM, 03-01-77
	AB	PAINTING PREPARATION	4	02:47PM, 03-01-77
0037	SE	TYPES	6	09:43PM, 01-26-77; 02:38PM, 01-31-77
	SE	TYPES	5	02:54PM, 02-02-77; 03:33PM, 02-08-77
	HM	SMALL ENGINE TYPES	5	02:43PM, 02-09-77; 02:59PM, 02-14-77
	AB	PAINTING PREPARATION	5	03:04PM, 02-14-77; 02:34PM, 02-16-77
	AM	4-STROKE CYCLE ENGINE OPERATION	5	02:37PM, 02-16-77; 03:00PM, 02-18-77
	MT	SHOP TERMS	5	02:11PM, 02-22-77; 02:02PM, 03-01-77
	AV	MEASUREMENT/ MICROMETERS	4	12:59PM, 03-07-77
0038	AV	MANUAL USE	6	09:57PM, 01-26-77; 03-15PM, 02-08-77
	AB	PAINTING PREPARATION	5	03:18PM, 02-08-77; 02:57PM, 02-11-77
	AM	4-STROKE CYCLE ENGINE OPERATION	6	12:51PM, 02-14-77; 03-02PM, 02-16-77
	SE	TYPES	5	01:09PM, 02-18-77; 01:50PM, 03-07-77
	HM	CLEANING	0	01:55PM, 03-07-77
0039	MT	SHOP TERMS	5	10:51AM, 01-26-77; 02:06PM, 02-01-77
	AV	SAFETY WIRING	6	02:12PM, 02-01-77; 01:30PM, 02-04-77
	SE	LUBRICATING	5	01:34PM, 02-04-77; 02:42PM, 02-08-77

	AB	PAINTING PREPARATION	5	02:55PM, 02-08-77; 02:46PM, 02-11-77
	AM	4-STROKE CYCLE ENGINE OPERATION	5	01:03PM, 02-14-77; 12:48PM, 02-17-77
	HM	SMALL ENGINE TYPES	5	12:41PM, 02-18-77; 02:37PM, 02-23-77
	AV	SAFETY WIRING	5	02:41PM, 02-23-77; 12:43PM, 03-02-77
0041	MT	SHOP TERMS	5	10:25AM, 01-26-77; 01:37PM, 02-10-77
	AB	PAINTING PREPARATION	6	01:41PM, 02-01-77; 02:20PM, 02-08-77
	HM	SMALL ENGINE TYPES	5	02:3 2PM, 02-08-77; 02:52PM, 02-11-77
	AM	SHOP SAFETY	5	03:17PM, 02-11-77; 02:08PM, 02-15-77
	AB	PAINTING PREPARATION	6	02:28PM, 02-15-77; 02:06PM, 02-18-77
	SE	LUBRICATING	5	02:10PM, 02-18-77; 02:31PM, 02-28-77
	AV	SAFETY WIRING	5	01:32PM, 03-01-77; 01:20PM, 03-07-77
	AB	PAINTING PREPARATION	6	01:35PM, 03-07077; 02:59PM, 03-07-77
0042	AV	POWER DRILL TOOLS	6	10:11AM, 01-26-77; 02:27PM, 02-02-77
	HM	SMALL ENGINE TYPES	6	02:42PM, 02-02-77; 03:36PM, 02-08-77
	SE	LUBRICATING	6	02:30PM, 02-09-77; 02:12PM, 02-14-77
	MT	GRINDING DRILL BIT	5	02:15PM, 02-14-77; 02:50PM, 02-16-77
	AM	ENGINE COOLING SYSTEM	6	02:55PM, 02-16-77; 02:43PM, 02-18-77
	SE	LUBRICATING	5	02:49PM, 02-18-77; 02:04PM, 02-23-77
	AB	PAINTING EQUIPMENT	6	02:07PM, 02-23-77; 02:31PM, 02-25-77
	AV	DRILL PRESS	6	01:26PM, 02-28-77; 02:46PM, 03-02-77

0043	AM	ENGINE COOLING SYSTEM	6	11:23AM, 01-26-77; 03:04PM, 01-31-77
	AB	PAINTING PREPARATION	6	01:55PM, 02-04-77; 03:01PM, 02-11-77
	SE	TYPES	5	01:32PM, 02-14-77; 02:07PM, 02-16-77
	AB	PAINTING PREPARATION	6	02:20PM, 02-16-77; 01:48PM, 02-18-77
	HM	SMALL ENGINE TYPES	6	01:13PM, 02-23-77; 01:18PM, 02-28-77
	MT	SHOP TERMS	4	01:38PM, 03-02-77; 11:41AM, 03-04-77
0044	MT	MEASUREMENT/ SCALE	5	01:49PM, 12-09-76; 01:17PM, 12-13-76
	AB	PAINTING PREPARATION	6	11:02AM, 01-26-77; 12:57PM, 02-03-77
	HM	CARBURETOR AIR CLEANERS	6	01:04PM, 02-03-77; 02:00PM, 02-09-77
	AV	MANUAL USE	6	01:28PM, 02-10-77; 02:36PM, 02-22-77
	MT	MEASUREMENT/ MICROMETERS	6	02:40PM, 02-22-77; 02:56PM, 03-01-77
	SE	CARBURETOR AIR CLEANERS	4	02:59PM, 03-01-77; 11:45AM, 03-02-77
0045	MT	SHOP TERMS	5	01:58PM, 01-25-77; 02:36PM, 02-01-77
	SE	TYPES	5	02:41PM, 02-01-77; 02:29PM, 02-04-77
	AM	ENGINE COOLING SYSTEM	6	02:49PM, 02-04-77; 12:53PM, 02-11-77
	AB	PAINTING PREPARATION	6	12:59PM, 02-11-77; 02:44PM, 02-15-77
	OH	PLANTING ORNAMENTAL TREES AND SHRUBS	5	02:47PM, 02-15-77; 01:22PM, 02-17-77
	AB	PAINTING PREPARATION	6	12:51PM, 02-18-77; 12:43PM, 02-23-77
	AM	ENGINE COOLING SYSTEM	6	12:47PM, 02-23-77; 01:38PM, 02-25-77
	AM	ENGINE COOLING SYSTEM	6	12:57PM, 02-28-77; 12:51PM, 03-01-77

	AB	PAINTING PREPARATION	6	12:54PM, 03-01-77; 03:02PM, 03-02-77
	AV	MANUAL USE	0	01:10PM, 03-03-77
0046	AB	PAINTING PREPARATION	6	12:48PM, 01-25-77; 02:32PM, 02-01-77
	AB	PAINTING PREPARATION	6	01:23PM, 02-02-77; 02:38PM, 02-04-77
	AM	ENGINE COOLING SYSTEM	6	02:42PM, 02-04-77; 01:10PM, 02-11-77
	SE	TYPES	5	01:13PM, 02-11-77; 01:52PM, 02-15-77
	HM	CARBURETOR AIR CLEANERS	5	01:56PM, 02-15-77; 01:38PM, 02-18-77
	MT	SHOP TERMS	5	01:41PM, 02-18-77; 02:44PM, 02-23-77
	AM	ENGINE COOLING SYSTEM	6	01:16PM, 02-24-77; 02:18PM, 02-28-77
	AB	PAINTING PREPARATION	6	02:23PM, 02-28-77; 02:59PM, 03-02-77
	AM	ENGINE COOLING SYSTEM	0	02:05PM, 03-07-77
	AM	4-STROKE CYCLE ENGINE OPERATION	0	02:43PM, 03-07-77
0047	MT	SHOP TERMS	5	02:10PM, 01-25-77; 02:49PM, 02-10-77
	SE	TYPES	6	02:53PM, 02-01-77; 01:51PM, 02--9-77
	AV	SAFETY WIRING	6	12:52PM, 02-10-77; 12:52PM, 02-16-77
	MT	GRINDING TOOL BIT	5	01:02PM, 02-16-77; 02:54PM, 02-23-77
	OH	PLANTING ORNAMENTAL TREES AND SHRUBS	6	12:44PM, 02-24-77; 01:30PM, 02-28-77
	AM	SHOP SAFETY	4	12:46PM, 03-02-77; 11:53AM, 03-04-77
0048	AM	INTROUDCTION AUTO/ENGINE	5	02:22PM, 01-25-77; 12:59PM, 02-01-77
	MT	GRINDING TOOL BIT	6	01:04PM, 02-01-77; 01:26PM, 02-09-77
	AV	MEASUREMENT/ MICROMETERS	6	01:30PM, 02-09-77; 12:56PM, 02-15-77

	SE	CLEANING	5	01:43PM, 02-16-77; 02:14PM, 02-18-77
	SM	ADJUSTING CARBURETORS	5	01:23PM, 02-18-77; 01:37PM, 02-23-77
	AB	PAINTING PREPARATION	6	01:41PM, 02-23-77; 02:09PM, 02-28-77
	HM	CARBURETOR AIR CLEANERS	5	01:13PM, 02-10-77; 02:26PM, 02-14-77
0049	AB	PAINTING EQUIPMENT	6	01:36PM, 01-28-77; 01:55PM, 02-02-77
	AM	4-STROKE CYCLE ENGINE OPERATION	5	02:00PM, 02-02-77; 02:18PM, 02-09-77
	SE	CARBURETOR AIR CLEANERS	5	01:13PM, 02-10-77; 02:26PM, 02-14-77
	MT	SHOP TERMS	5	02:28PM, 02-14-77; 02:23PM, 02-16-77
	AB	PAINTING EQUIPMENT	6	02:26PM, 02-16-77; 02:24PM, 02-22-77
	AV	SAFETY WIRING	5	02:27PM, 02-22-77; 01:53PM, 02-25-77
	SE	CLEANING	5	01:58PM, 02-05-77; 01:03PM, 03-01-77
	AB	PAINTING EQUIPMENT	4	01:06PM, 03-01-77; 11:37AM, 03-02-77
	HM	LUBRICATING	5	01:08PM, 03-02-77; 01:07PM, 03-07-77
0050	AV	MANUAL USE	6	12:59PM, 01-31-77; 01:01PM, 02-09-77
	AB	PAINTING EQUIPMENT	6	01:06PM, 02-09-77; 01:44PM, 02-14-77
	SE	TYPES	5	01:52PM, 02-14-77; 03:02PM, 02-16-77
	AM	BASIC HAND TOOLS	5	03:08PM, 02-16-77; 02:14PM, 02-22-77
	MT	SHOP TERMS	5	02:18PM, 02-22-77; 01:20PM, 02-24-77
	OH	PLANTING ORNAMENTAL TREES AND SHRUBS	5	01:24PM, 02-24-77; 01:42PM, 02-28-77
	AB	PAINTING EQUIPMENT	6	01:47PM, 02-28-77; 02:26PM, 03-02-77
	AV	MANUAL USE	4	09:44AM, 03-03-77

0051	MT	MEASUREMENT/ MICROMETERS	5	01:06PM, 02-02-77; 03:11PM, 02-08-77
	SE	CLEANING	5	01:32PM, 02-08-77; 01:34PM, 02-11-77
	AB	PAINTING EQUIPMENT	6	01:38PM, 02-11-77; 02-59PM, 02-15-77
	OH	PLANTING ORNAMENTAL TREES AND SHRUBS	5	03:01PM, 02-15-77; 12:56PM, 02-17-77
	AM	SHOP SAFETY	5	01:09PM, 02-17-77; 02:00PM, 02-22-77
	AV	MEASUREMENT/ MICROMETERS	5	02:03PM, 02-22-77; 01:00PM, 02-25-77
	SE	TYPES	5	01:34PM, 02-25-77; 02:09PM, 03-01-77
	AB	PAINTING EQUIPMENT	6	02:39PM, 03-01-77; 12:44PM, 03-03-77
	AB	PAINTING EQUIPMENT	0	02:26PM, 03-07-77

APPENDIX I

CMI Project Student Survey

1. What did you like abou the six-week exploratory program?

2. What did you not like about the six-week exploratory program?

3. Did you enjoy using the computer to help you learn? If yes, what did you like best and tell us why. If no, what was it that you did not like and why.

4. What would you suggest to improve the exploratory program using the computer to help you learn?